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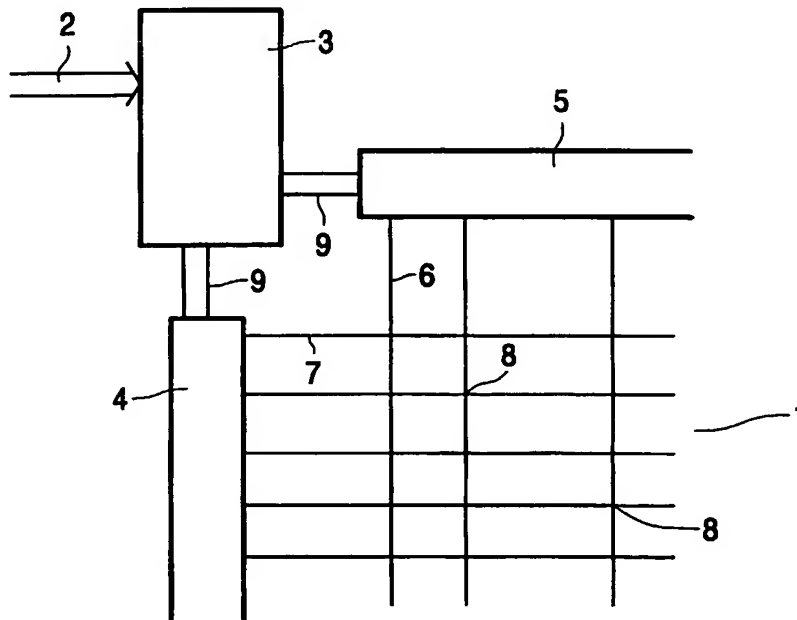
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Declaration under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG,

[Continued on next page]

(54) Title: LIQUID CRYSTAL DISPLAY DEVICE



(57) Abstract: In RMS driving (both Alt & Pleshko and MRA addressing) of passive matrix devices flicker and power are reduced by driving groups of picture elements during time periods within a sequence of time periods while the driving of different picture elements within a sequence of time periods is phase-shifted over at least one time period, while the phase shifting is altered after each sequence of time periods. The principle of phase-shifting is also applicable to active matrix driving.



ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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INTERNATIONAL SEARCH REPORT

Inter

Application No

IB 03/04829

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G09G3/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G09G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 479 188 A (MORIYAMA HIROAKI) 26 December 1995 (1995-12-26) the whole document	1,7
Y		3,11
X	OHISHI I ET AL: "AN EVALUATION OF FLICKER ON SPACE MODULATED FRAME RATE CONTROL MULTI-GRAY SHADING METHODS FOR STN-LCDS" IEICE TRANSACTIONS ON ELECTRONICS, INSTITUTE OF ELECTRONICS INFORMATION AND COMM. ENG. TOKYO, JP, vol. E79-C, no. 8, 1 August 1996 (1996-08-01), pages 1063-1068, XP000632424 ISSN: 0916-8524 the whole document	1,2,7
Y		3,11

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 February 2004

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INTERNATIONAL SEARCH REPORT

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P B 03/04829

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 774 101 A (KAWAGUCHI KAZUYOSHI ET AL) 30 June 1998 (1998-06-30)	2,7,13
Y	the whole document	3,11
X	--- SASAKI I ET AL: "MAGIC-SQUARE-METHOD FRAME-RATE-CONTROL TECHNOLOGY" SID INTERNATIONAL SYMPOSIUM DIGEST OF TECHNICAL PAPERS. SAN JOSE, JUNE 14 - 16, 1994, SANTA ANA, SID, US, vol. 25, 14 June 1994 (1994-06-14), pages 259-262, XP000462709	1,7
Y	the whole document	3,11
X	--- US 5 565 883 A (SHIMIZU TOSHIKAZU) 15 October 1996 (1996-10-15)	1,7
Y	the whole document	3,11
Y	--- EP 0 364 307 A (COMPAQ COMPUTER CORP) 18 April 1990 (1990-04-18)	3,11
Y	the whole document	3,11
Y	--- US 5 337 408 A (TSANG SIU K ET AL) 9 August 1994 (1994-08-09)	3,11
Y	the whole document	3,11
Y	--- US 5 400 044 A (THOMAS ALASDAIR R P) 21 March 1995 (1995-03-21)	3,11
	the whole document	

INTERNATIONAL SEARCH REPORT

Application No.
PCT/IB 03/04829

Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-8, 11, 13

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8,11,13

The first concept concerns a display comprising a liquid crystal between two substrates, selection electrodes, data electrodes, and drive means for driving the selection electrodes with a sequence of m , $m > 1$, time periods, wherein during each time period the selection electrodes are sequentially supplied with selection signals, and the drive means comprising further means for driving a group of picture elements during time periods within a sequence of time periods, the driving of different picture elements within a sequence of time periods being phase-shifted with respect to each other, wherein

the problem of flicker is minimized by decreasing or increasing the phase numbers of the time periods after each sequence of time periods.

2. Claims: 1,2,9,10,12

The second concept concerns a display comprising a liquid crystal between two substrates, selection electrodes, data electrodes, and drive means for driving the selection electrodes with a sequence of m , $m > 1$, time periods, wherein during each time period the selection electrodes are sequentially supplied with selection signals, and the drive means comprising further means for driving a group of picture elements during time periods within a sequence of time periods, the driving of different picture elements within a sequence of time periods being phase-shifted with respect to each other, wherein

the problem of generating grey scales is solved by applying different voltages to the column electrodes during sub-selection times of a period of supplying a selection signal to a selection electrode.

INTERNATIONAL SEARCH REPORT

Intern.

pplication No

P B 03/04829

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5479188	A	26-12-1995	JP 6347758 A KR 126876 B1	22-12-1994 29-12-1997
US 5774101	A	30-06-1998	JP 8234164 A	13-09-1996
US 5565883	A	15-10-1996	JP 3001317 B2 JP 5249436 A	24-01-2000 28-09-1993
EP 0364307	A	18-04-1990	US 5068649 A CA 1326081 C DE 68923594 D1 DE 68923594 T2 EP 0364307 A2 JP 2176718 A KR 147296 B1 US 5245328 A	26-11-1991 11-01-1994 31-08-1995 04-04-1996 18-04-1990 09-07-1990 15-09-1998 14-09-1993
US 5337408	A	09-08-1994	US 5630163 A	13-05-1997
US 5400044	A	21-03-1995	GB 2245743 A	08-01-1992